

Third International Symposium on  
**Fatigue Design and Material Defects 3**  
September 19-22, 2017  
Lecco – Italy

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The fatigue properties of materials/components are usually controlled by the presence of defects due to the manufacturing process that significantly reduce the fatigue strength and service life with respect to the theoretical values of a material. In general, the presence of defects accelerates the initial phase of fatigue damage, a process that involves a volume of a few microstructural units.

Therefore, non-metallic inclusions with dimensions of the order of ten microns play a key role in the fatigue strength of bearings and springs. Microfolds and oxide entrapments with dimensions of the order of 100 microns can be critical for the fatigue properties of forged components. Inhomogeneities and defects (gas pores, cavities) of larger size affect the quality of metal castings and modern Additive Manufacturing processes.

The concepts of **defect tolerant design**, developed more than 20 years ago, aim to cover the gap between simple stress-based design approaches with generous safety factors, the methods developed for fracture assessment of components and NDE requirements.

The ability to predict fatigue properties and service life of components in relation to their manufacturing process is of special interest also for the modern Additive Manufacturing (AM) processes, whose rapid evolution needs efficient tools for product development, fatigue assessment and component qualifications.

Following the successful symposia of Trondheim in 2011 and Paris in 2014, these topics will be discussed at the Third International Symposium on **Fatigue Design and Material Defects - 3**, to be held in September 2017 in Lecco, Italy.

**Plenary lectures** will cover key problems and applications:

- T. Ghidini (ESA, Netherlands) will address the fatigue assessment & qualification techniques for AM being developed at the European Space Agency;
- S. Daniewicz and N. Shamsaei (Mississippi State University, USA) will report about the American route to the fatigue assessment of AM components;
- M. Hughes (Siemens Industrial Turbomachinery, UK) will describe material problems related to power generation components;
- J.Y. Buffiere (Insa, Lyon) will address fatigue cracking from 3D defects;
- M. Cova (Sacmi, Italy) will deal with the design and qualification of large cast iron structures.

## Topics

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| • Assessment of fatigue endurance taking material defects into account - predictive methods | • Mechanisms of crack formation and growth                 | • Component qualification and inspection  |
| • Computational tools for defective materials   | • Competition between microstructural features and defects | • Additive Manufacturing                  |
|   | • Statistical analysis of defects                          | • Defect mapping and novel NDE techniques |
|   |  | • Design standards and best practice      |

The conference papers will be published in **Procedia Structural Integrity**, thanks to the support by the European Structural Integrity Society (ESIS). A number of papers selected by the Scientific Advisory Committee will appear in a Special Issue of *International Journal of Fatigue*.

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## LOCATION

Polo di Lecco is one of several international campuses of the Politecnico di Milano. Ever since 2006, when the Master Programs in English were first introduced, the presence of international students has steadily increased. A total of 621 students from all over the world have participated in the programs' first seven years.



**Lecco** is a city of 48,131 inhabitants in [Lombardy](#), northern Italy, 50 kilometres (31 mi) north of [Milan](#), the capital of the [province of Lecco](#). It lies at the end of the south-eastern branch of [Lake Como](#) (the branch named *Lake Lecco / Lago di Lecco*). The [Bergamo Alps](#) rise to the north and east and are cut through by the [Valsassina](#), Lecco marking the southern end.



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